ATTACHMENT V

Establishment of Smog Indices for New Light-Duty Vehicles

The purpose of smog indices is to indicate to consumers who are purchasing vehicles the contribution a vehicle will make to ozone formation relative to other vehicles within that vehicle class.

The Air Resources Board (ARB) has approved a requirement to include smog indices on the window labels of new light-duty vehicles (i.e., those with a gross vehicle weight of 6,000 lbs. or less). The ARB has also petitioned the Federal Trade Commission (FTC) to include smog indices in the FTC's Buyers Guide for used vehicles. The FTC has not yet acted on this petition. If the FTC denies the ARB's petition, the ARB will then require that smog indices for used light-duty vehicles be displayed on a perforated attachment to the FTC's Buyers Guide. The ARB will be proposing smog indices for used vehicles at a later date.

Smog indices are based on exhaust and evaporative emissions of ozone precursors. Ozone precursor emissions include exhaust non-methane organic gas emissions (NMOG), exhaust oxides of nitrogen emissions (NOx), and evaporative hydrocarbon emissions (HC). A smog index of 1.00 is assigned to new passenger cars, light-duty trucks 0-3750 lbs LVW, and light-duty trucks 3751-5750 lbs LVW which certify to Tier 1 standards for exhaust emissions and which certify to the old evaporative emission standards that are currently being phased out. A vehicle which is assigned a smog index of 1.00 is considered to be a "base vehicle." New vehicles which certify to more stringent emission standards than these are assigned smog indices of less than 1.00. Older used vehicles will eventually be assigned smog indices which are greater than 1.00.

A smog index is based on the ratio of exhaust NMOG, exhaust NOx, and evaporative HC emissions from any given vehicle to those of the base vehicle. Because there is no clear way to determine the relative impact on ozone formation due to these pollutants, the formula which was derived to develop smog indices gives equal weight to exhaust NMOG, exhaust NOx, and evaporative HC when estimating their impact on ozone formation. (The ARB historically has taken a dual approach to reducing ozone within California. This approach is designed to reduce both NMOG (or "ozone-forming HC") and NOx from motor vehicles, stationary sources, etc..) The formula used for these calculations is:

$$\text{Smog Index} = \frac{\text{exhaust NMOG (g/mi)} + \text{exhaust NOx (g/mi)} + \text{evaporative HC (g/mi)}}{\text{exhaust NMOG (g/mi)} + \text{exhaust NOx (g/mi)} + \text{evaporative HC (g/mi)}}$$

vehicle for which smog index is calculated / *base vehicle*

The NMOG and NOx emission values which are used in the equation are the 50,000 mile exhaust emission standards to which the vehicle is certified. (For example, for a Tier 1 passenger

car, the 50,000 mile exhaust NMOG and NOx standards are 0.25 g/mi and 0.4 g/mi, respectively. For a TLEV passenger car, the 50,000 mile exhaust NMOG and NOx standards are 0.125 g/mi and 0.4 g/mi, respectively. For a LEV passenger car, the 50,000 mile exhaust NMOG and NOx standards are 0.075 g/mi and 0.2 g/mi, respectively. For a ULEV passenger car, the 50,000 mile exhaust NMOG and NOx standards are 0.040 g/mi and 0.2 g/mi, respectively.)

Evaporative HC emissions are estimated using an emission model (MOBILE 5) assuming: reformulated gasoline is used, daily temperatures swings of 72° F to 96° F, an inspection and maintenance program is in place (such as exists in California), and failures of the evaporative emission control system are caught by on-board diagnostics II (OBD II). Using these assumptions, evaporative emissions are estimated to be 0.48 g/mi for vehicles which certify to the old evaporative emission standards and 0.14 for vehicles which certify to the new evaporative emission standards.

The decision was made to use a model estimate of the evaporative emissions from vehicles rather than the evaporative emission standards because the evaporative emission standards which are currently being phase-in are based on extreme conditions (three continuous days at 105° F). Because smog indices are intended as educational tools to show the public the relative impact of a particular vehicle on ozone formation relative to other comparable vehicles, the ARB staff decided to base smog indices on evaporative emission estimates which are more representative of average summer days in the South Coast Air Basin (72° F to 96° F), rather than higher temperature conditions which occur on a few days of the year. Because Phase II (reformulated) gasoline will be sold in California beginning in 1996, evaporative emissions are estimated assuming the use of reformulated gasoline. (Reformulated gasoline has a lower vapor pressure and, therefore, results in lower evaporative emissions that conventional gasoline.) California regulations which require light-duty vehicles to be equipped with OBD II systems are currently being phased-in. By 1998, the model-year in which smog index labels will be required, 100 percent of new light-duty vehicles must be equipped with OBD II systems. Therefore, evaporative emission estimates assume the use of these systems.

Sample Calculation:

Using the assumptions described above, the smog index for a LEV passenger car which is certified to the new evaporative emission regulations can be calculated as follows:

$$\text{Smog Index} = \frac{\text{LEV certifying to the new evaporative emission regulations}}{\text{base vehicle}} = \frac{0.075 \text{ g/mi} + 0.2 \text{ g/mi} + 0.14 \text{ g/mi}}{0.25 \text{ g/mi} + 0.4 \text{ g/mi} + 0.48 \text{ g/mi}} = 0.37$$